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Research Article

PREVALENCE OF DOG INTESTINAL PARASITES AND ZOONOTIC IMPORTANCE OF THEM IN SARAB CITY, IRAN

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ABSTRACT
Coprological examination was used to estimate the prevalence of gastrointestinal parasites in domiciled dogs from Sarabctiy, Iran. Risk factors for dog infection were assessed in relation to demographic, husbandry and management data. The dog owners completed a questionnaire survey on some aspects of dog parasitism such as parasite species, mechanisms of infection, awareness of zoonotic diseases and history of anthelmintic usage.
The study was carried out in Sarabctiy, Iran. From October 2013 to September 2014, faecal samples from 125 dogs were examined for the presence of parasites. Parasites were found in the faeces of 37 dogs, with an overall prevalence of 29.6%. The following parasites and their respective frequencies were detected: Ancylostoma (10.4%), Giardia (7.2%), Toxocaracanis (3.2%), Trichurisvulpis (4.8%), Cryptosporidium (4 %). The answers of dog owners to the questionnaire showed that the majority does not know the species of dog intestinal parasites, the mechanisms of transmission, the risk factors for zoonotic infections, and specific prophylactic measures.

Keywords: *Intestinal Parasites, Dog, zoonoses, Sarab City, Iran*

INTRODUCTION
Uncontrolled population of stray and semi-domesticated dogs in close proximity to increasing densities of human population in urban environments is a common fact in developing countries, which, in conjunction with the lack of veterinary attention and zoonotic awareness, increases the risks of disease transmission (Traub *et al.*, 2005). In most Iranian cities, government actions such as providing the population with information about the risks of zoonotic disease transmitted by domestic animals, and control of stray animals are practically non-existent, resulting in an increasing risk of exposure to zoo noses transmitted by these animals (Oliveira-Sequeira *et al.*, 2002).
In developing countries, the risk of zoonotic infection related to domiciled dogs is also high because the obligations placed on dog owners are less restrictive (Macpherson, 2005). As a consequence, even domiciled animals go on harbouring parasitic infections, including those to which treatment and effective control methods are available. The presence of these animals in close contact with people constitutes a high potential risk, especially to children an immunocompromised individual (Robertso *et al.*, 2000). Recently, the canine population of inner Sa˜o Paulo state cities (the most developed state in the country) was estimated as being of one dog for each four inhabitants (1: 4) (Alves *et al.*, 2005), a ratio significantly above that referred to by the World Health Organization (WHO, 1992) for developing countries. In this study, another fact highlighted was that in small cities (<100 000 inhabitants), the proportion of stray dogs (approximately 9%) and of domiciled dogs that are raised with free access to the streets (approximately 35%) is higher. The high number of stray dogs was attributed to the great availability of food, probably because of the garbage scattered in the streets and the disposition of dog-loving people in feeding these animals. It is important to point out that smaller cities are exactly where the availability of health care services to humans and pet animals is scarce or even absent. Most of the studies on human infection by canine parasitic zoonoses in Iran are of sporadic case reports of unusual presentation, or studies of the prevalence of more common canine zoonoses, such as cutaneous larva migrans (CLM) and

toxocariasis (Teixeira *et al.*, 2006). However, several studies show high prevalence of intestinal parasites in stray and domiciled dogs (Labruna *et al.*, 2006), as well as high rates of environmental contamination with eggs and larvae of canine intestinal parasites (Castro *et al.*, 2005). Nevertheless, there was no information about risk perception by dog owners or continuing public education regarding the potential hazard of dogs as a source of zoonotic diseases. Therefore, the aim of this study was to determine the prevalence of canine intestinal parasites and the possible risk factors associated with dog infection. Information obtained from a questionnaire survey was also employed to analyse the level of knowledge of dog owners on canine intestinal parasites and the extent to which they were aware of zoonotic parasitic infection.

MATERIALS AND METHODS

Study Area

The study was carried out in Sarabctiy, Iran. From October 2013 to September 2014, faecal samples from 125 dogs were examined for the presence of parasites.

Faecal samples were collected immediately after spontaneouselimination for observation of the macroscopiccharacteristics, such as consistency, and the presence ofparasites. Demographic (age, gender, breed) and husbandry (single or multi-dog household) data of domicileddogs were obtained from owners.

Parasitological Procedures

Unpreserved faecal samples were stored in closed containers (+4C) and processed within 24 h. Each sample wasmicroscopically examined for parasite eggs, cysts andoocysts after concentration by centrifugal sedimentation (CS) technique, and by centrifugal flotation using saturatedzinc sulphate (Sloss *et al.*, 1999). A modified Ziehl-Neelsen stain (Henriksen and Pohlenz, 1981) was used to screen Cryptosporidium oocysts.

Statistical Analysis

The observed prevalence and 95% confidence intervals(CI) were calculated for each parasite (Bush *et al.*, 1997). Associations between parasitism and host factors (age, sex,breed, single/multi-dog household) werecalculated for all the 125 dogs, and the associationbetween parasitism and anti-helminthic usages was evaluatedfor owned dogs (125). All the analyses weremade using chi-squared tests for two independent proportionsemploying the Pop tools software (CSIRO, 2008).

RESULTS AND DISCUSSION

Results

Faecal samples from 125 dogs were examined for thepresence of parasite. Intestinal parasiteswere found in the faeces of 37 dogs, with an overall prevalence of 29.6%. The following parasites and their respective frequencies were detected: Ancylostoma (10.4%), Giardia (7.2%), Toxocaracanis (3.2%), Trichurisvulpis (4.8%), Cryptosporidium (4 %), (Figure 1-4). Dogs harboring one parasite genera were more common (29%) than ones harboring two (24%), three (4.8%) or four (1.2%). Helminthic infections (23) were more frequent ($P < 0.01$) than protozoan (14), (Table -1).

Table 1: Intestinal parasites diagnosed in dogsfrom Sarab city, Iran

Parasites	**dogs (n = 125)**	**Prevalence %**
Ancylostoma spp.	13	10.4
Toxocaracanis	4	3.2
Trichurisvulpis	6	4.8
Giardia spp.	9	7.2
Cryptosporidium spp.	5	4
Total parasite infection	**37**	**29.6**

According to information provided by owners, 95 ofthe 125 domiciled dogs have received some kind ofanthelmintic treatment, and among these, 30 have beentreated within 6 months before the collection. After stratifyingthe groups by last known anthelmintic treatment (either considering 30 or 95 dogs as dewormed), no differencein parasite prevalence was observed between dogsassumed to be dewormed and not-dewormed.

Seventy-seven owners (of 92), responsible for 103domiciled animals, answered the questionnaire intendedto evaluate the level of their knowledge on canine intestinalparasites. Four of the other 15 owners were movedelsewhere, and the other 11 owners refused to answer thequestions.

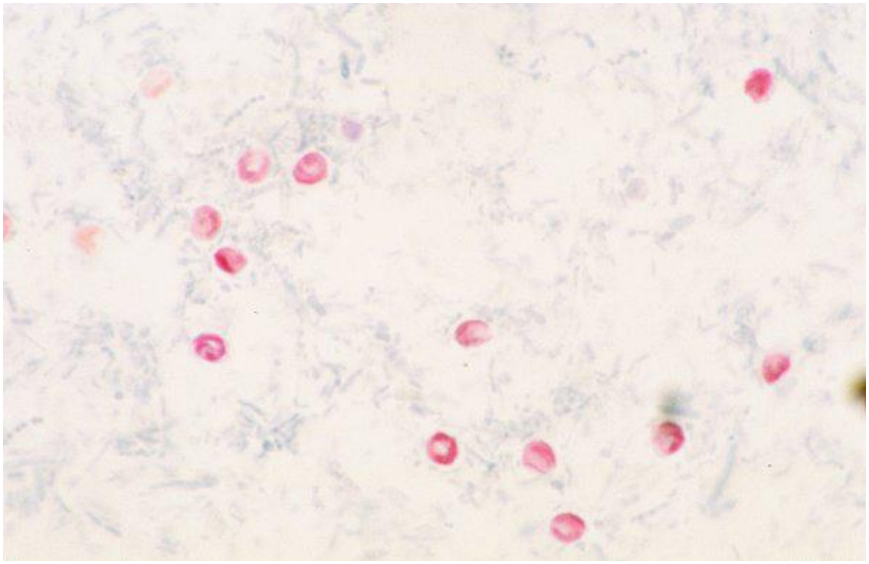

Figure 1: Oocysts of *Cryptosporidium* stained with modified Ziehl- Neelsen

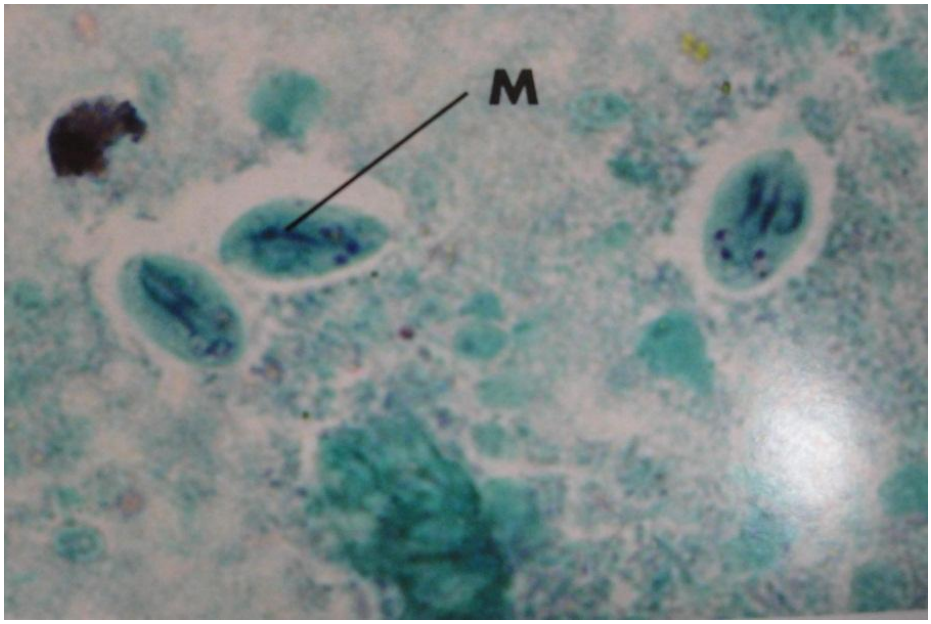

Figure 2: Cysts of *Giardia* in Fecal smear of dogs

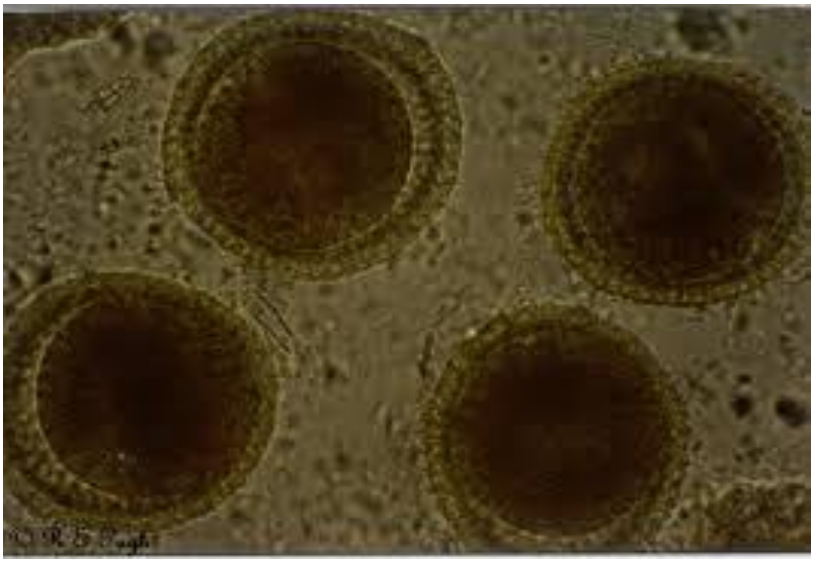

Figure 3: *Toxocara canis* eggs in fecal smear of dogs.

Figure 4: *Trichuris vulpis* eggs in fecal smear of dogs

Discussion

The overall prevalence of canine intestinal parasites foundin this study (29.6%), revealed a very high level of infection that requires an effective anti-parasite control program. According to the studies conducted in different countries worldwide, the estimate prevalences of dog intestinal parasites vary from 5 to 70% (Blagburn *et al.*, 1996; Bugg *et al.*, 1999), and some factors such as geographical location, status of animal ownership, sampling protocols, demographic factors, anthelmintic usage, and diagnostic techniques areresponsible for the wide range of endoparasite prevalence.

The predominance of helminthic upon enteric protozoaninfections in dogs observed here is similar to other recent observations in Iran (Eslami *et al.*, 2007), other countries of Latin America (Ramı´rez-Barrios *et al.*, 2004; Ponce-Macotela *et al.*, 2005; Fontanarrosa *et al.*, 2006), and other placesin the world (Inpankaew *et al.*, 2007; Martı´nez-Moreno *et al.*, 2007). The trend of reducing helminthic andincreasing protozoan infection in Australia was attributedto an increasing routine use of anti-helminthics (Bugg *et*

al., 1999) and to the knowledge of dog owners about potential zoonotic transmission of these agents and howto control them (Schantz, 1999). These facts stand in contrast to the current situation found in this study.

Iran is a country of continental dimensions; whose regions present great climatic conditions, cultural and socioeconomic differences. In most developed regions, human developmental indicators as well as the veterinary services available to dogs (pets) are comparable to those found in developed countries. In less developed regions,the weak infrastructure is similar to that found in poor countries of Africa, Asia and Latin America where most of the people have no access to the services in both public health and veterinary sectors. However, the prevalence of the different species of intestinal canine parasites found in this study was similar to those recently registered, both in the developed regions of the country (Gennari *et al.,* 1999; Oliveira-Sequeira *et al.,* 2002; Santos and Castro, 2006) and in less developed (HDI = 0.6) ones (Labruna *et al.,*2006). These data suggest that the socioeconomic differences between regions are insufficient to produce significant alteration on the spatial prevalence of canine intestinal parasites in this country.

Among the parasites found in our survey, Ancylostomaspp., T. canis, Giardia spp. and Cryptosporidium spp. Are considered responsible for important zoonotic infections.

Ancylostoma spp. was the most common parasite detected in dogs, occurring in single or mixed infections. Identified risk factors for dog hook worm infection were whether the dog was raised in amulti-dog household or had originated from a refuge.

Ancylostoma spp. has been referred to as one of the most frequent intestinal parasite of dogs in Iran (Eslami *et al.,* 2007) and other countries (Bugg *et al.,*1999; Minnaar *et al.,* 2002; Blazius *et al.,* 2005; Wang*et al.,* 2006). Besides A. caninum, which is one of the most pathogenic species for dogs, larvae and adults of different Ancylostoma species are involved in human infections.

Cutaneous larva migrans or creeping eruption (Velho*et al.,* 2003) is the most common of them. In Iran, reliable epidemiological data about CLM in native populationis scarce, but a population-based study (Heukelbach *et al.,* 2004) demonstrated that CLM is endemic in adeprived community. The high frequency of Ancylostoma spp. found in this study, suggests that this condition could be more widely distributed than it is currently believed. However, the overlooking of these diseases by the population itself and by health care professionals (Heukelbach *et al.,* 2004) makes it difficult to evaluate the actual importance of CLM. Similarly, human infection by adults of A. caninum, already reported in other countries (Prociv and Croese, 1996), has not been diagnosed in Iran.

The overall frequency of T. canis (3.2%) obtained here is comparable to those obtained in previous studies performed in the last 20 year in Iran. These data suggest that there was no significant downward long-term trend in the prevalence of this parasite as reported in other countries (Robertson and Thompson, 2002).

In a recent survey on epidemiology of toxocariasis in Iran, Muradian *et al.,* (2005) showed a high correspondence between the frequency of infection in dogs under1 year, soil contamination and children serology. In this study, the frequency of infected dogs (8.7%) was significantly lower than that reported by those authors, however, only 5.5% of these dogs were younger. The great fertility of these worms, associated with the great resistance of T. canis eggs (Jordan *et al.,* 1993) contribute decisively for a cumulative environmental contamination, representing a higher risk of human infection than suggested by the infection rate of dogs (Oliveira-Sequeira *et al.,* 2002). This may be one of the reasons why the human infection by T. canis is the most commonly acquired zoonoses from companion animals in the Iran, despite decrease in the prevalence of infected dogsin the last two decades (Robertson and Thompson, 2002).

Giardia spp. was the most frequent protozoan found indogs (7.2%), similar to what has been registered in Iran (Rahbari *et al.,* 2005) and in developed countries (Bugg *et al.,* 1999; Palmer *et al.,* 2008). In Australia, Giardia spp. is the most frequent intestinal parasite in dogs. This high prevalence was attributed to the fact that Giardia spp. can colonize niche previously occupied by parasites such as T. canis and Dipylidium caninum, and most of the anthelmintics do not interfere in the development of Giardia spp.

(Bugg*et al.,* 1999). This does not seem to be a viable explanation for the high prevalence of Giardia spp. found in this study for two reasons. Firstly, Giardia was one of the most frequent in poliparasitized animals; second, the higher frequency of infection was found in dogs, which are not the target of anthelmintic treatment.

The clinical significance of Giardia spp. appears minimal, as most of dog infections are asymptomatic. Although there has been much speculation about the public health significance of companion animals (Thompson, 2004), human infections are primordially attributed to anthroponotic transmission. Nevertheless, Giardia duodenalisgeno type A1 was reported in both child and itsdog in Iran, suggesting the putative existence of a zoonotic cycle in the studied population (Rahbari *et al.,* 2007). These findings highlight that zoonotic transmission could represent a public health problem in developing countries, especially in communities that are socio economically handicapped.

The low prevalence of Cryptosporidium spp. Diagnosed here was consistent with previous studies on dog population in Iran (Rahbari *et al.,* 2007) and worldwide (Causape *et al.,* 1996; Fontanarrosa *et al.,*2006; Dubna´ *et al.,* 2007). Cryptosporidiasis is a frequent cause of diarrhoeal disease in humans, and in developing countries, Cryptosporidium spp. infections occur mostly in children younger than 5 years. In the majority of humanpatients, C. parvum (human and cattle genotype) and C. hominis have been identified, but other species (C. meleagridis, C. felis) and genotypes (C. parvum doggenotype) were detected in a proportion of immunocompetent children (Xiao *et al.,* 2004). The relative importance of zoonotic transmission in the epidemiology of cryptosporidiasis is not entirely clear. Recently, in Lima, Peru (Xiao *et al.,* 2007), two children and their dog were diagnosed with Cryptosporidium canis infections during the same period, suggesting the possibility of the transmission of cryptosporidiasis among human and dogs.

It was evident from this study that most of owners are not aware of the zoonotic potential of the parasites carried by their dogs, or their mode of transmission to humans. This lack of knowledge seems to be the main reason for the apparent negligence of the owners in deworming their dogs. These findings contrasts to what was referred in Australia (Bugg *et al.,* 1999) where the majority of owners were aware of zoonotic parasites and so, dewormed their dogs on a regular basis.

Finally, veterinary schools should emphasize the client education in training veterinarians as a means to prevent or minimize zoonotic disease transmissions.

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